TERIDIAN SEMICONDUCTOR CORP.

Simplifying System Integration™

73S1217F
Evaluation Board Lite User Guide

August 17, 2009
Rev. 1.2
UG_1217F_046

© 2009 Teridian Semiconductor Corporation. All rights reserved.
Teridian Semiconductor Corporation is a registered trademark of Teridian Semiconductor Corporation.
Simplifying System Integration is a trademark of Teridian Semiconductor Corporation.
Microsoft, Windows and Vista are registered trademarks of Microsoft Corporation.
Signum is a trademark of Signum Systems Corporation.
Keil is a trademark of ARM® Ltd.
Linux is a registered trademark of Linus Torvalds.
Slackware is a registered trademark of Patrick Volkerding and Slackware Linux, Inc.
Fedora is a registered trademark of RedHat, Inc.
All other trademarks are the property of their respective owners.

Teridian Semiconductor Corporation makes no warranty for the use of its products, other than expressly contained in the Company's warranty detailed in the Teridian Semiconductor Corporation standard Terms and Conditions. The company assumes no responsibility for any errors which may appear in this document, reserves the right to change devices or specifications detailed herein at any time without notice and does not make any commitment to update the information contained herein. Accordingly, the reader is cautioned to verify that this document is current by comparing it to the latest version on http://www.teridian.com or by checking with your sales representative.

Teridian Semiconductor Corp., 6440 Oak Canyon, Suite 100, Irvine, CA 92618
TEL (714) 508-8800, FAX (714) 508-8877, http://www.teridian.com

Table of Contents

1 Introduction 4
1.1 Evaluation Board Lite Package Contents 5
1.2 Evaluation Board Lite Features 5
1.3 Recommended Equipment and Test Tools 5
2 Evaluation Board Lite Basic Setup 6
2.1 Using the Evaluation Board Lite with an Emulation Tool 7
2.2 Loading User Code into the Evaluation Board-Lite 7
3 Using the USB CCID Application 9
3.1 Driver and Software Installation 9
3.2 Frequently Asked Questions 10
4 Evaluation Board Lite Hardware Description 12
4.1 Jumpers, Switches and Test Points 12
4.2 Schematic 15
4.3 PCB Layouts 16
4.4 Bill of Materials 19
4.5 Schematic Information 21
4.5.1 Reset Circuit 21
4.5.2 Oscillators 21
4.5.3 USB Interface 22
4.5.4 Smart Card Interface 22
5 Ordering Information 24
6 Related Documentation 24
7 Contact Information 24
Revision History 25

Figures

Figure 1: 73S1217F Evaluation Board Lite 4
Figure 2: 73S1217F Evaluation Board Lite Basic Connections 6
Figure 3: Emulator Window Showing RESET and ERASE Buttons 8
Figure 4: Emulator Window Showing Erased Flash Memory and File Load Menu 8
Figure 9: 73S1217F Evaluation Board Lite Jumper, Switch and Test Point Locations 14
Figure 10: 73S1217F Evaluation Board Lite Electrical Schematic 15
Figure 11: 73S1217F Evaluation Board Lite Top View (Silkscreen) 16
Figure 12: 73S1217F Evaluation Board Lite Bottom View (Silkscreen) 16
Figure 13: 73S1217F Evaluation Board Lite Top Signal Layer 17
Figure 14: 73S1217F Evaluation Board Lite Middle Layer 1 – Ground Plane 17
Figure 15: 73S1217F Evaluation Board Lite Middle Layer 2 – Supply Plane 18
Figure 16: 73S1217F Evaluation Board Lite Bottom Signal Layer 18
Figure 5: External Components for RESET 21
Figure 6: Oscillator Circuit 21
Figure 7: USB Connections 22
Figure 8: Smart Card Connections 23

Tables

Table 1: Flash Programming Interface Signals 7
Table 2: Evaluation Board Lite Jumper, Switch and Test Point Description 12
Table 3: 73S1217F Evaluation Board Lite Bill of Materials 19

1 Introduction

The Teridian Semiconductor Corporation (TSC) 73S1217F Evaluation Board Lite is used as a platform to demonstrate the capabilities of the 73S1217F Smart Card Controller devices. It has been designed to operate either as a standalone or a development platform.

The 73S1217F Evaluation Board Lite can be programmed to run any of the Teridian turnkey applications or a user-developed custom application. Teridian provides its USB CCID application preloaded on the board and an EMV testing application on the CD.

Applications can be downloaded through the In-Circuit-Emulator (ICE) or through the TSC Flash Programmer Model TFP2. As a development tool, the Evaluation Board Lite has been designed to operate in conjunction with an ICE to develop and debug 73S1217F based embedded applications.

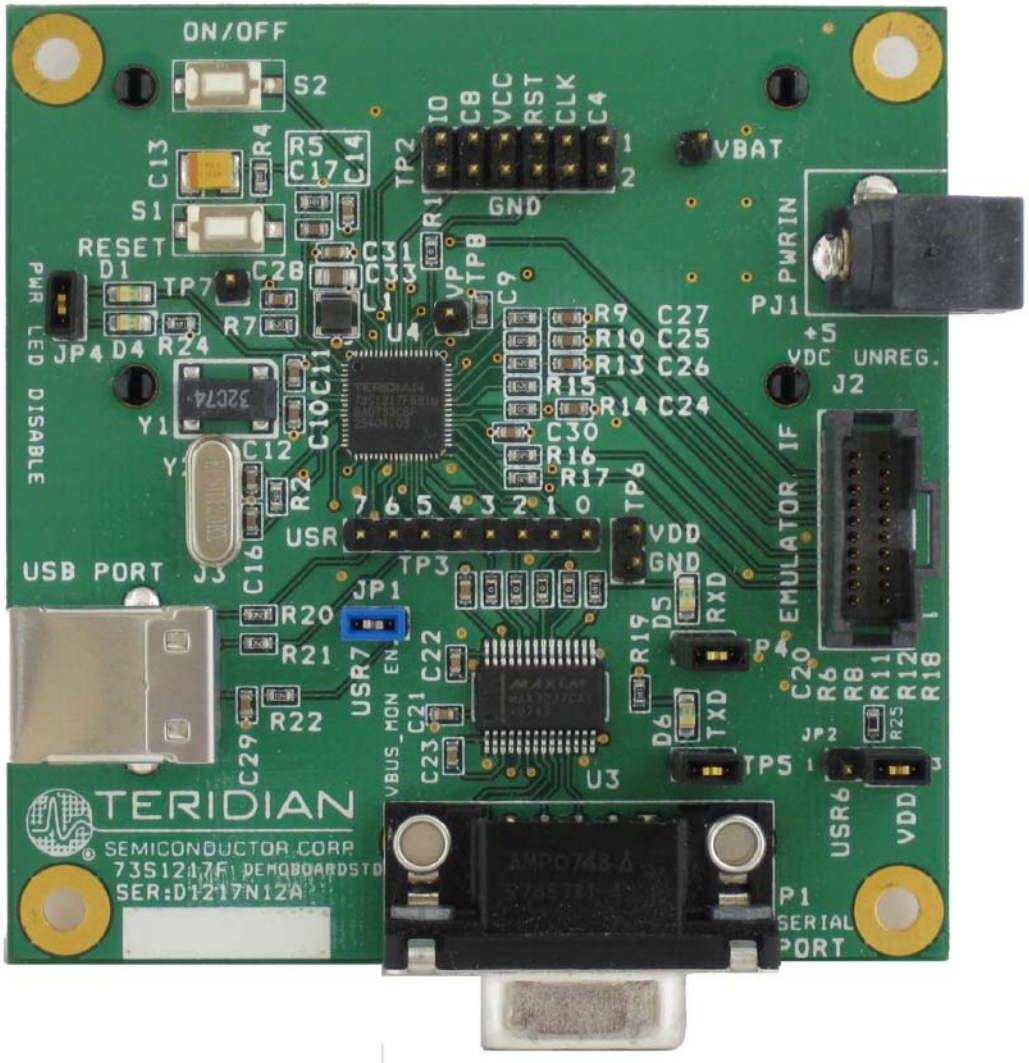


Figure 1: 73S1217F Evaluation Board Lite

1.1 Evaluation Board Lite Package Contents

The 73S1217F Evaluation Board Lite package contains the following:

- 73S1217F Evaluation Board Lite: 4-layer, square PWB as shown in Figure 1, containing the 73S1217F with the preloaded turnkey USB CCID application.
- USB cable, A-B, male, 2 meters.
- CD containing documentation (data sheet, board schematics, BOM and layout), Software API libraries, evaluation code and utilities.

1.2 Evaluation Board Lite Features

The 73S1217F Evaluation Board Lite (see Figure 1) includes the following:

- USB 2.0 full speed interface
- RS-232 interface
- Single smart card interface
- Battery backup power interface
- ICE/Programmer interface
- ON/OFF switch for battery backup operation
- Real Time Clock (RTC) capability
- 1 LED

1.3 Recommended Equipment and Test Tools

The following equipment and tools (not provided) are recommended for use with the 73S1217F Evaluation Board Lite package:

- For functional evaluation: PC with Microsoft® Windows® XP or Vista®, or a Linux® workstation equipped with a USB port or an RS232 (COM) port with a DB9 connector.
- For software development (MPU code)
  - Signum™ ICE (In Circuit Emulator): ADM-51. Refer to http://signum.temp.veriohosting.com/Signum.htm.
  - Keil™ 8051 C Compiler Kit: CA51. Refer to http://www.keil.com/c51/ca51kit.htm and http://www.keil.com/product/sales.htm.

2 Evaluation Board Lite Basic Setup

Figure 2 shows the basic connections of the Evaluation Board-Lite with the external equipment.

The power supply can come from two sources:

- The +5 V coming from the USB bus (default) when connected to a computer or hub able to support USB powered devices. In this case the ON/OFF switch, S2, has no effect and power is always on. When the board is powered from the USB bus, the application is bus-powered and the embedded application must be designed for this.
- Any AC-DC converter block able to generate a DC power supply of 4.0 V min to 6.5 V max at 400 mA for backup power for those applications capable of using it. This power is connected to the PJ1 connector. When using the PJ1 power input, the ON/OFF switch, S2, controls the power to the 73S1217F.

The communication with an external host can be accommodated by either:

- A standard USB2.0 full speed interface or
- A standard RS-232 serial interface (TX/RX only).

The board provides by default the USB CCID application. Refer to Section 3 for information on setting up and running the USB CCID application.

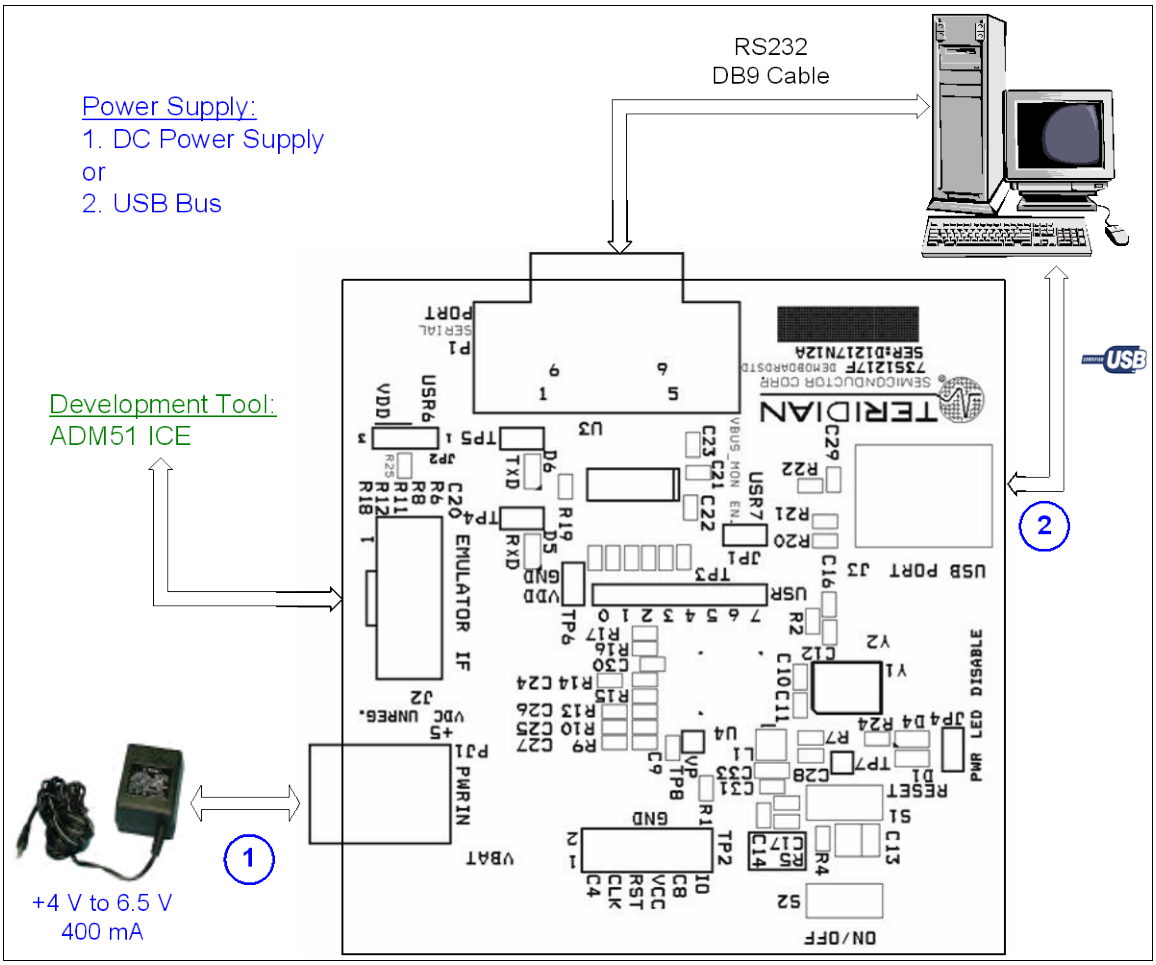


Figure 2: 73S1217F Evaluation Board Lite Basic Connections

2.1 Using the Evaluation Board Lite with an Emulation Tool

The 73S1217F Evaluation Board Lite can operate with an In-Circuit-Emulator (ICE) from Signum Systems (model ADM-51). The Signum System POD has a ribbon cable that must be directly attached to connector J2 (see Figure 2).

Signum Systems offers different pod options depending on user needs. The standard pod allows users to perform typical emulator functions such as symbolic debugging, in-line breakpoints, memory examination/modification, etc. Other pod options enable code trace capability and/or complex breakpoints at an additional cost.



When using an ICE, the board must be either USB bus powered or VBAT powered (and turned on via the ON/OFF switch). The power LED D4 will indicate the power status.

2.2 Loading User Code into the Evaluation Board-Lite

The signals listed in Table 1 are necessary for communication between the TFP2 Flash Programmer or ICE and the 73S1217F.

Table 1: Flash Programming Interface Signals

Signal	Direction	Function
E_TCLK	Output from 73S1217F	Data clock
E_RXTX	Bi-directional	Data input/output
E_RST[1]	Bi-directional	Flash Downloader Reset (active low)
[1] The E_RST signal should only be driven by the TFP2 when enabling these interface signals. The TFP2 must release E_RST at all other times.		

The signals in Table 1, along with 3.3 V and GND, are available on the emulator header J2. Production modules may be equipped with much simpler programming connectors, e.g. a 5x1 header.

Programming of the flash memory requires either the Signum Systems ADM51 in-circuit emulator or the TSC Flash Programmer Model TFP2 provided by Teridian.

Loading Code with the In-Circuit Emulator

If firmware exists in the 73S1217F flash memory, the memory must be erased before loading a new file into memory. In order to erase the flash memory, the RESET button in the emulator software must be clicked followed by the ERASE button (see Figure 3).

Once the flash memory is erased, a new file can be loaded using the Load command in the File menu. The dialog box shown in Figure 4 makes it possible to select the file to be loaded by clicking the Browse button. Once the file is selected, pressing the OK button loads the file into the flash memory of the IC.

At this point, the emulator probe (cable) can be removed. Once the 73S1217F device is reset using the reset button on the evaluation board, the new code starts executing.

Loading Code with the TSC Flash Programmer Model TFP2

Follow the instructions given in the *TSC Flash Programmer Model TFP2 User's Manual*.

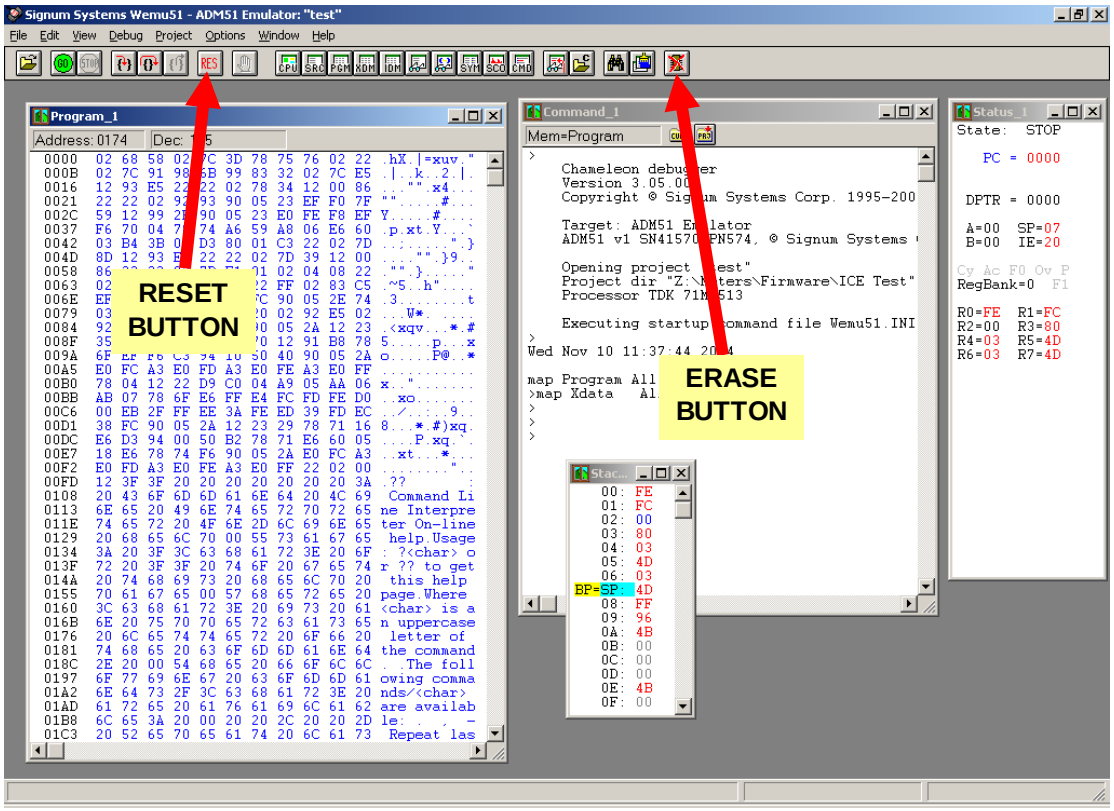


Figure 3: Emulator Window Showing RESET and ERASE Buttons

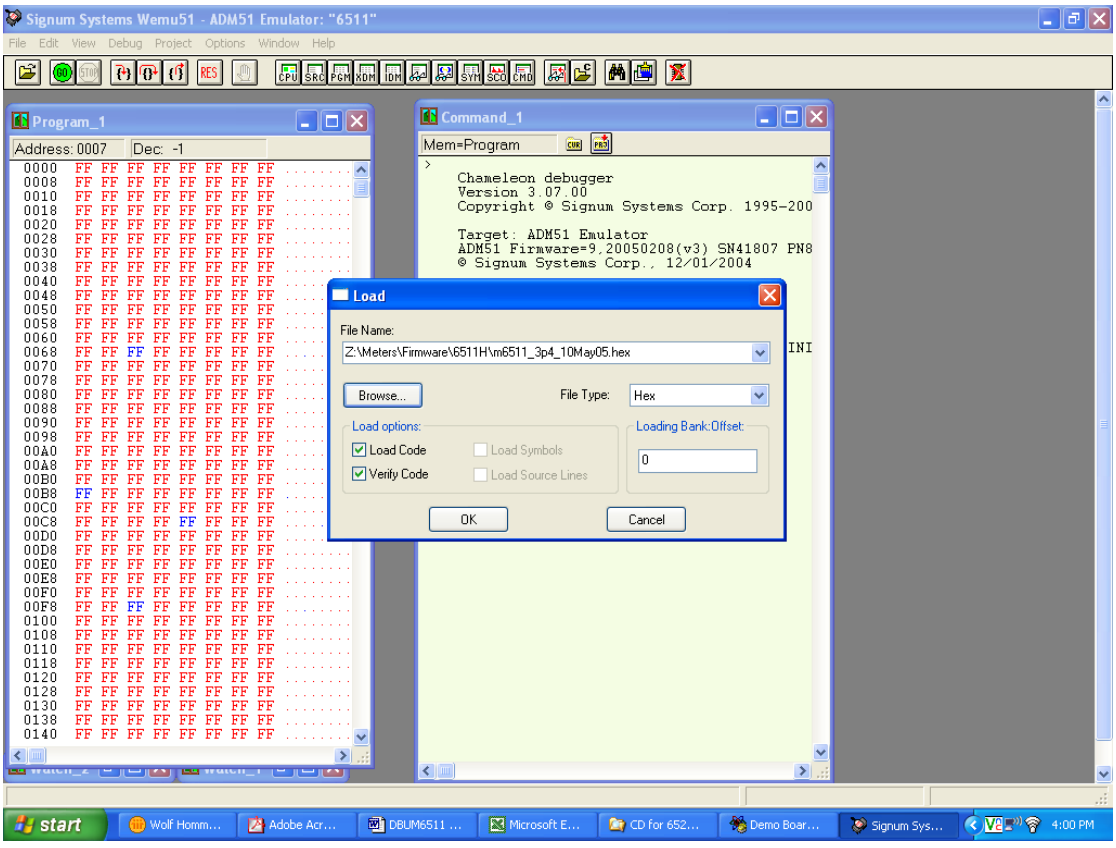


Figure 4: Emulator Window Showing Erased Flash Memory and File Load Menu

3 Using the USB CCID Application

The USB CCID firmware is pre-installed on the 73S1217F Evaluation Board Lite. To operate correctly, it requires a PC with the appropriate driver installed to be connected through its USB port. When powered-up, the board is able to run with the demonstration host application included on the CD.

The demonstration application is named CCID-USB.vshost.exe and is located in the "C:\TSC\12xxF V***y.yy***\CCID USB Host App C#\App\Bin" directory (where ***y.yy*** is the latest version of the firmware release). This is a host application that allows:

- Smart card activation and deactivation, in ISO or EMV mode.
- Smart card APDU commands to be exchanged with the smart card inserted in the board.
- Starting a test sequence in order to test and evaluate the board performance against an EMV test environment.

3.1 Driver and Software Installation

Installation on Windows XP

Two drivers are available for use with Windows XP:

- The standard Microsoft Windows XP driver and
- The Teridian provided driver that adds additional features beyond the capabilities of the Microsoft driver. See the *73S1215F, 73S1217F CCID Application Note* for further details on the differences between the two drivers.

When using this 73S1217F Evaluation Board Lite, the Microsoft provided driver should be used used as the TSC drivers extended features are not available on the Evaluation Board-Lite.

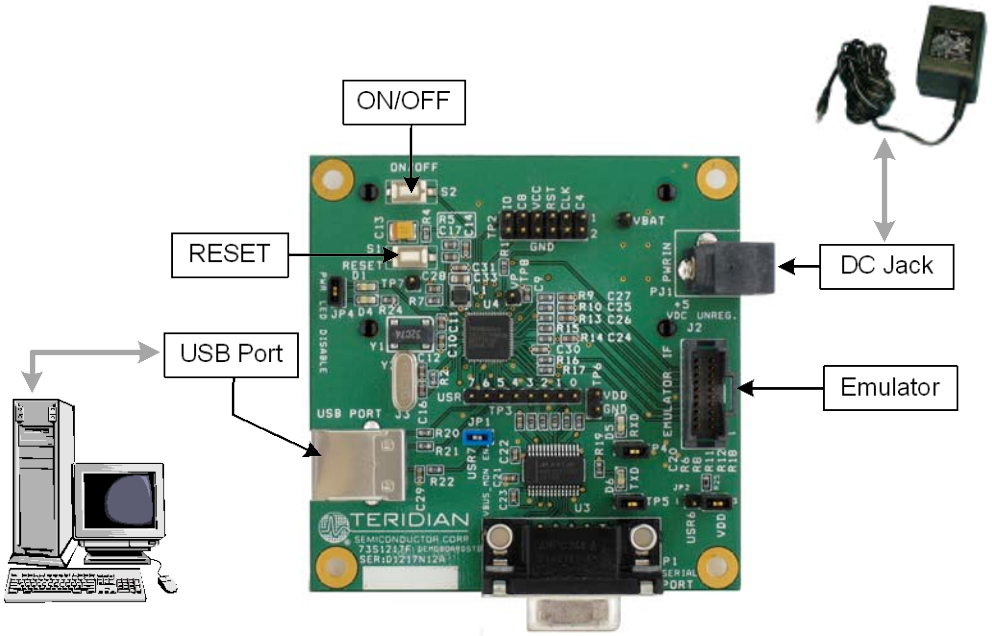


The Microsoft CCID driver included in the CD is used by Teridian for testing. Check with Microsoft for the latest driver upgrades.

Follow these steps to install the software on a PC running Windows XP:

- Extract "12xxF CCID+DFU V***y.yy*** Release.zip" (where ***y.yy*** is the latest version of the firmware release).
  - Create an install directory. For example: "C:\TSC\".
  - Unzip "12xxF CCID+DFU V***y.yy*** Release.zip" to the just created folder. All applications and documentation needed to run the board with a Windows PC will be loaded to this folder. Plug the supplied power adaptor into the DC Jack and a wall outlet. LED0 should now come on.
- Connect the USB cable between the host system and the 73S1217F Evaluation Board Lite. The host system should recognize the board and start the Add New Hardware Installation wizard. When the wizard prompts, select the Microsoft Windows standard driver:
  - Select the usbccid.inf file located in the "C:\TSC\12xxF CCID+DFU V***y.yy*** Release\USB-CCID Firmware\CCID USB\CCID+DFU USB Drivers\MS Generic" subdirectory. The uscccid.inf and usbccid.sys files must be in the same directory on the host.
- Follow the prompts until the process is completed.
- Run CCID-DFU_USB_v***y.yy***.exe (located in the path - C:\TSC\12xxF CCID+DFU C:\TSC\12xxF CCID+DFU V2.00 Release\Host Applications\Windows App\Bin\Release Release\Host Applications\Windows App\Bin\Release) on the host system to execute the host demonstration application.

At this point the application window should appear. For additional information regarding the use of the Teridian Host application, refer to the *73S12xxF USB-CCID Host GUI Users Guide* (UG_12xxF_037).



Installation on a Linux System

Teridian has tested 73S1217F Evaluation Board -Lite with the Linux CCID driver v1.3.2 and PCSC-Lite v.1.4.4 (middleware) on two distributions of Linux: Slackware® 6 with kernel 2.4.16, and Fedora® 7 with kernel 2.6.23. Refer to the *73S1215F, 73S1217F CCID USB Linux Driver Installation Guide* (UG_12xxF_041) for details on the Linux software installation and usage.

3.2 Frequently Asked Questions

Windows

Q: The PC/SC application starts but it shows a “No Reader Found” message.

A: Follow these steps to make sure:

1. The board has powered up properly (USB is securely connected and there is power applied to the board).
2. Control Panel – System – Hardware – Device Manager – Smart Card Readers shows: “Teridian Semiconductors USB CCID Smart Card Reader...” And there is no yellow “!” or red “X”.
3. Smart Card Service has started by going to “Control Panel – Administrative Tools – Services – Smart Card”. Look under the “status” column and if it shows “stopped”, hit the restart or start button to start it.
4. If all of the above look ok, hit the refresh button on the CCIDUSB.exe application.

Q: There is a yellow “!” on the Teridian driver shown on the Device Manager menu.

A: This usually means the driver did not complete the driver enumeration process. Push the reset button on the development board a few times. If the board is connected to the host via a USB HUB, remove the HUB and try connecting the development board directly to the PC USB port to make sure the driver and the board can enumerate with the USB host. If the problem persists, check the driver on the PC to make sure it is at least version 6.0.0.2. Contact your Teridian Sales Rep for the latest version of the driver. Sometimes, rebooting the PC Host to clear up any previous USB problem will help to resolve the problem.

Q: There is a red “X” on the Teridian driver shown on the Device Manager menu.

A: This usually means the smart card driver has been disabled. Highlight and right click on the driver to re-enable.

Q: The Teridian Smart Reader is nowhere to be found on the Device Manager menu and there is an "unknown USB device" found where the Teridian Evaluation Board Lite should be.

A: This usually means the development board is properly powered up but there is no enumeration taking place. If the development board is connected to a USB HUB, remove the HUB and connect the board directly to the PC USB port, or move it to a different USB port on the system. If the problem persists and it is absolutely sure that the development board is properly powered up, it is possible that there is no firmware in the part. Contact a Teridian sales representative for reprogramming of the Flash.

Q: The Teridian driver is loaded. What to do to replace it with the Microsoft Generic USB CCID driver?

A: Right click on the Teridian driver in the Device Manager Menu, select "Update Driver..". Select "No, Not this time" on the next menu, "Install from a list or specific location", "Don't Search, I will choose the driver to install". If the next menu does not show the Microsoft Generic USB CCID driver, select "Have Disk" and browse to where the driver file resides (usually in the "CCID USB XPDriver" folder) and select the file. Follow through with the installation wizard.

Linux

Q: How can I see debug messages from PCSC-Lite when I run pcscd from the command line?

A: Before invoking pcscd, open the file /usr/local/pcsc/drivers/ifd-ccid.bundle/Contents/Info.plist in an editor, and set ifdLogLevel to 7. Save the change. Then run the command "pcscd –f –d" in a console. Now pcscd runs in foreground and should display many messages in the console. These messages show information about the smart card readers that have been detected, and whether or not a smart card is present in the reader. Also shown in the messages are the data exchanges between the host (Linux) and the smart card reader. The most important messages are the error messages that pcscd displays when a critical error has occurred. If fewer messages are desired, set IfdLogLevel to 3 or 1.

Q: When I run the command "pcscd –f –d", I get an error message that says "file /var/run/pcscd.pub already exists. Another pcscd seems to be running".

A: Only one instance of pcscd (PCSC-Lite Daemon) should be running at any time. If you receive this error message when invoking the pcscd program, pcscd is probably currently running already. If your intention is to restart pcscd, first terminate the pcscd that is currently running. You can run the command "ps aux | grep pcscd" to obtain the PID (Process ID) of the current pcscd. For example, you may see output similar to the following:

```
[root@localhost ~]# ps aux | grep pcscd
root 3380  0.1  0.0    74588  1752    pts/2     Sl+       16:06    0:02 pcscd –f –d
[root@localhost ~]#
```

The PID of pcscd in this case is 3380. Next run the command "kill 3380" to stop the currently running pcscd. Then start pcscd again by entering the command "pcscd –f –d".

Q: When I start the program pcsc_scan, I receive an error message saying "PCSC Not Running".

A: The pcsc_scan program requires the services provided by pcscd. Hence the PCSC-Lite daemon pcscd should be already running before pcsc_scan can start. Run pcscd first, and then invoke pcsc_scan.

4 Evaluation Board Lite Hardware Description

4.1 Jumpers, Switches and Test Points

Table 2 describes the 73S1217F Evaluation Board Lite jumpers, switches and modules. The Item # in Table 2 references Figure 9. The default setting refers to setup for running USB-CCID application..

Table 2: Evaluation Board Lite Jumper, Switch and Test Point Description

Item #	Schematic and Silkscreen Reference	Default setting	Name	Use
1	S1		Reset button	Evaluation board main reset: Asserts a hardware reset to the on-board 73S1217F.
2	S2		On / Off button	When using battery power (on PJ1), turns on or off (toggles) power to the 73S1217F device.
3	TP8		VP test point	Test point used for monitoring the VP voltage. VP is 5.5 V when the 72S1217F is on.
4	TP2		ICC test point	Smart card interface test points with ground pins.
5	TP1		Vbat test point	VBAT input test point.
6	TP3		USR pin test points	USR pin test points.
7	PJ1	No Connect	DC Jack	VBAT input power jack. VBAT use is optional and must be between 4.0 V and 6.5 V. VBAT draws power only when VBUS power is absent. VBAT use is selected by means of the ON/OFF switch.
8	TP6		VDD test point	VDD test point with ground.
9	J2	No Connect	In-Circuit Emulator connector	This connector must be used when using an external In-Circuit Emulator(ADM51). Refer to Electrical Schematic for pin assignments.
10	D5		RXD LED	Reflects the activity on the serial RX: Data going TO the 73S1217F.
11	TP4	Not Inserted	RXD LED jumper	Jumper inserted enables RX LED. Jumper removed disables RX LED.
12	D6		TXD LED	Reflects the activity on the serial TX: Data coming FROM the 73S1217F.
13	JP2	Not Inserted	Serial transceiver enable jumper	This jumper controls the RS-232 transceiver shutdown function. There are three possible configurations: • Removed; places RS-232 transceiver chip in shutdown. • Inserted VDD; enables RS-232 transceiver. • Inserted USR6; allows USR6 pin to control RS-232 transceiver shutdown.
14	TP5	Not Inserted	TXD LED jumper	Jumper inserted enables TX LED. Jumper removed disables TX LED.

Item #	Schematic and Silkscreen Reference	Default setting	Name	Use
15	P1	No Connect	DB9 RS232 female socket	This socket allows connection of a RS232 cable to a computer. Use a crossed wired (RX/TX) cable. The evaluation board has an on-board level shifter (U7) to allow direct connection to a computer.
16	JP1	Insert	USB interrupt jumper	This jumper allows VBUS (after level conversion) to connect to USR7 (configured for interrupt). Remove this jumper if not needed and USR7 can be used for another purpose.
17	–		Board reference and serial number	Should be mentioned in any communication with Teridian when requesting support.
18	J3	Connect	USB connector	Standard USB socket. Requires a standard USB 1.1 or 2.0 device cable to connect to a computer.
19	D4		Power LED	Power LED – comes on with VDD. Can be disabled by removing JP4.
20	JP4	Insert	Power LED disable	Inserting this jumper enables the power LED with VDD. Removing the jumper disables the power LED.
21	D1		LED0	73S1217F LED0 output LED.
22	TP7		VPC test point	Test point to monitor VPC. VPC is the input power source to the internal voltage converter. This voltage is derived from either VBUS or VBAT. See the *73S1217F Data Sheet* for further information.
23	J1		Smart Card connector	Allows the evaluation board to communicate with a smart card using a standard (credit card size) format: This slot is connected to the 73S1217F external card interface.

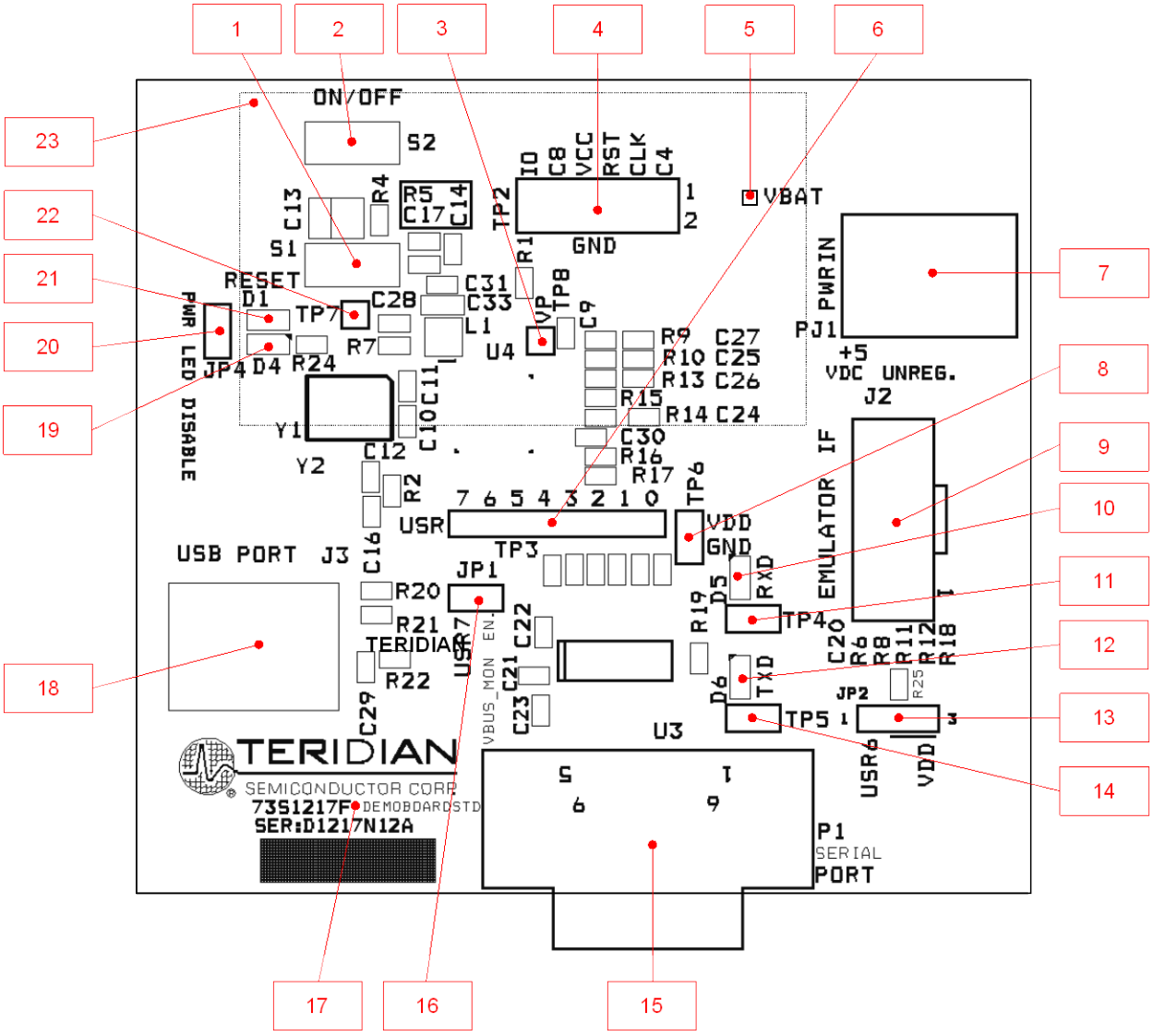


Figure 5: 73S1217F Evaluation Board Lite Jumper, Switch and Test Point Locations

4.2 Schematic

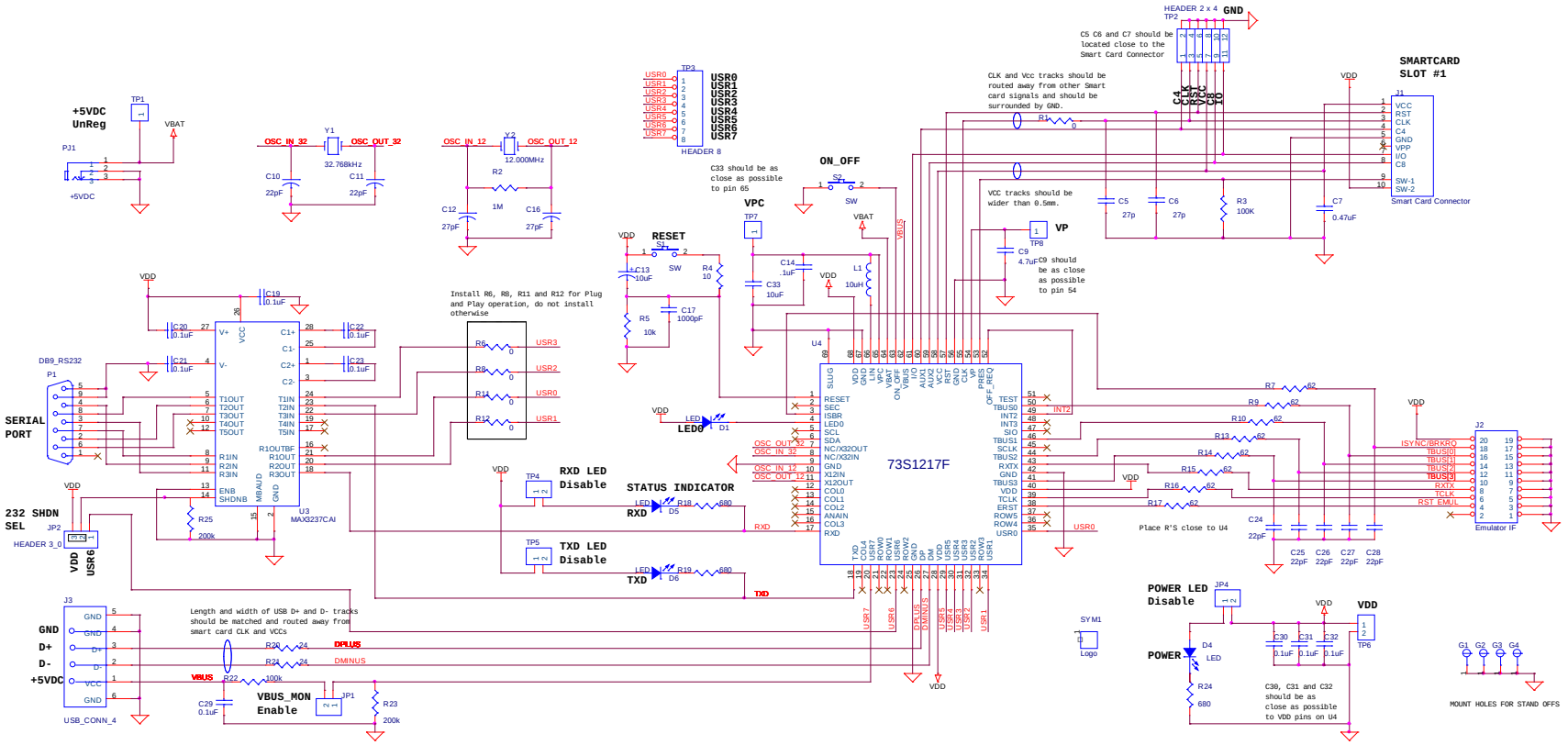


Figure 6: 73S1217F Evaluation Board Lite Electrical Schematic

4.3 PCB Layouts

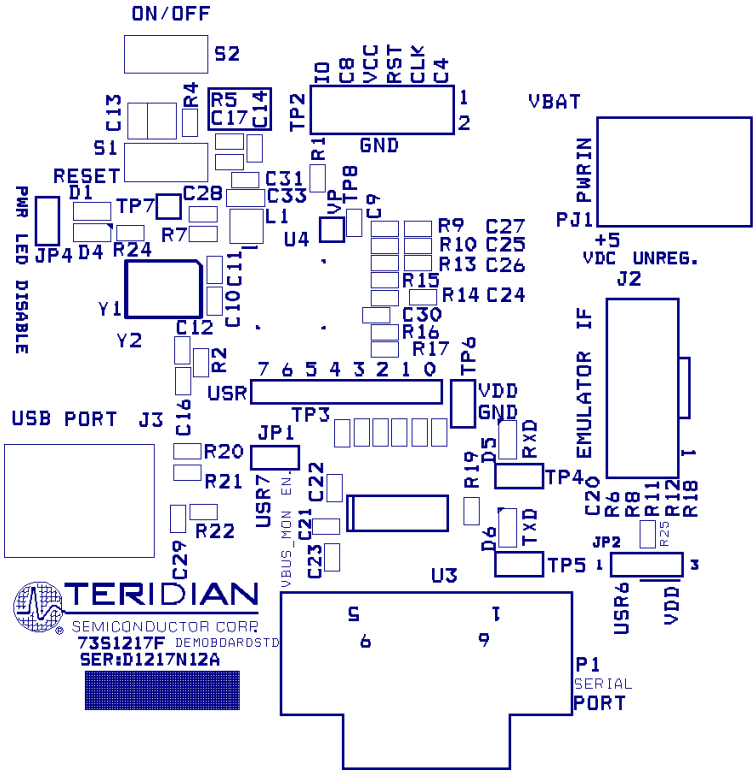


Figure 7: 73S1217F Evaluation Board Lite Top View (Silkscreen)

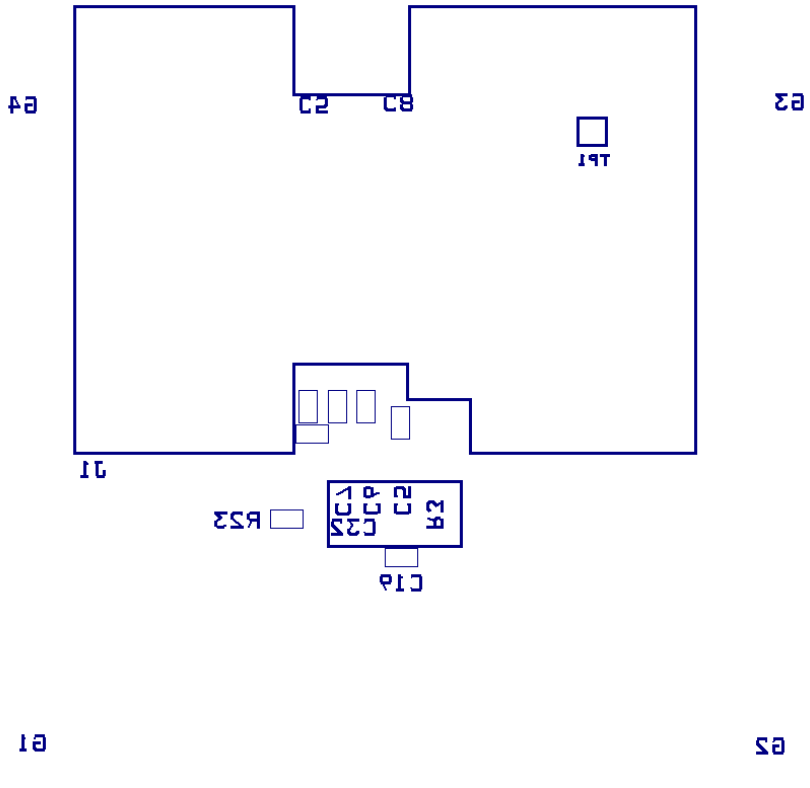


Figure 8: 73S1217F Evaluation Board Lite Bottom View (Silkscreen)

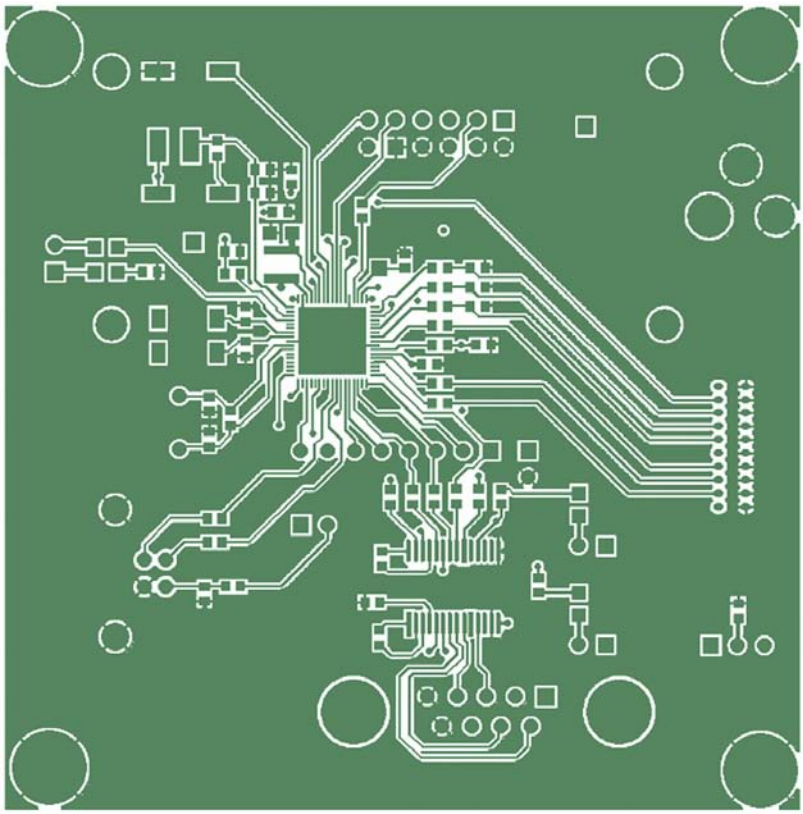


Figure 9: 73S1217F Evaluation Board Lite Top Signal Layer

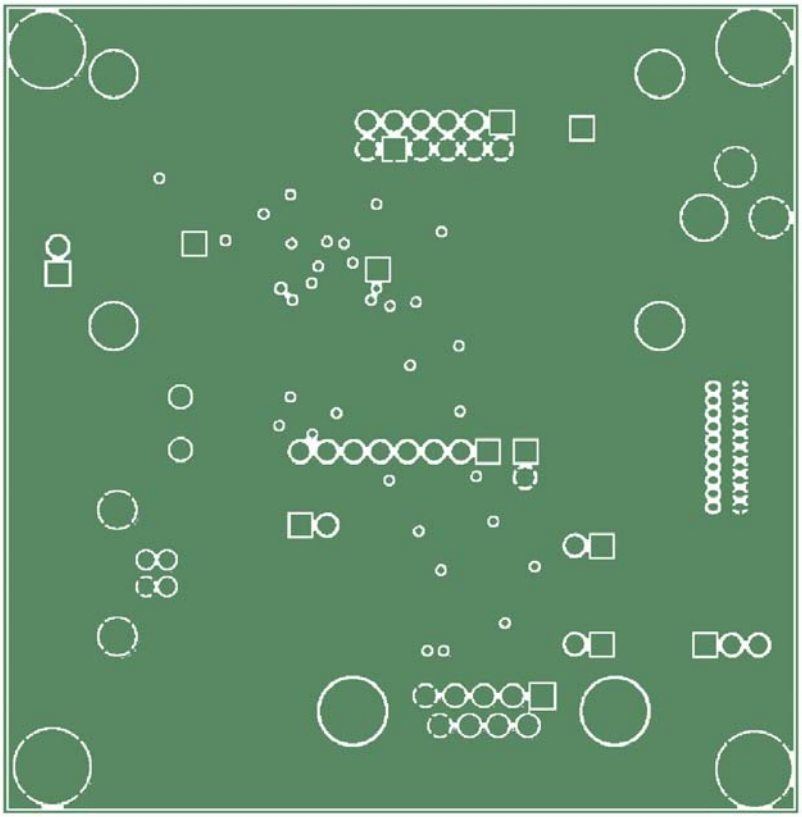


Figure 10: 73S1217F Evaluation Board Lite Middle Layer 1 – Ground Plane

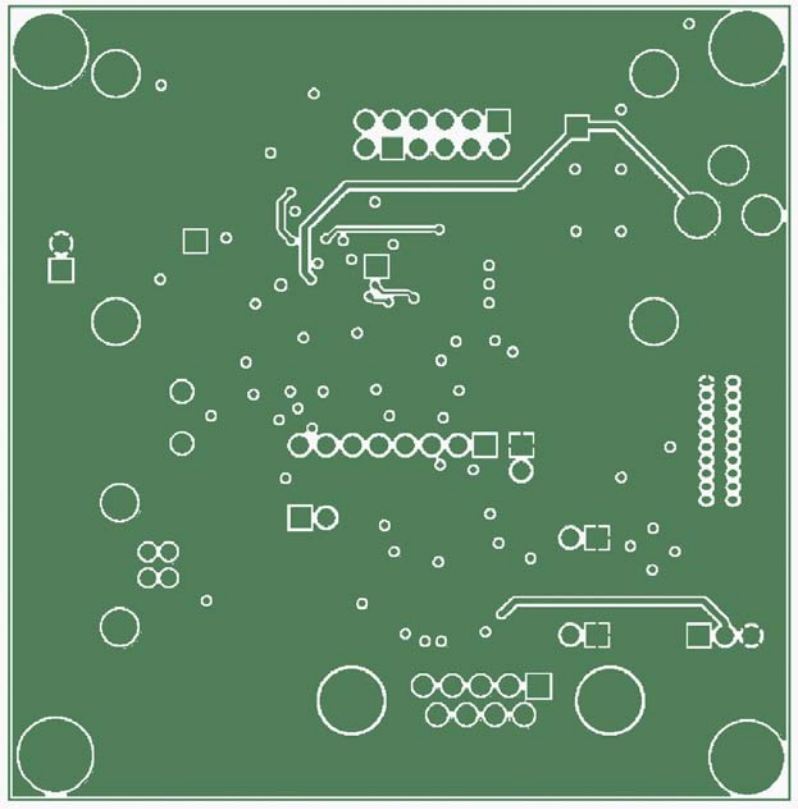


Figure 11: 73S1217F Evaluation Board Lite Middle Layer 2 – Supply Plane

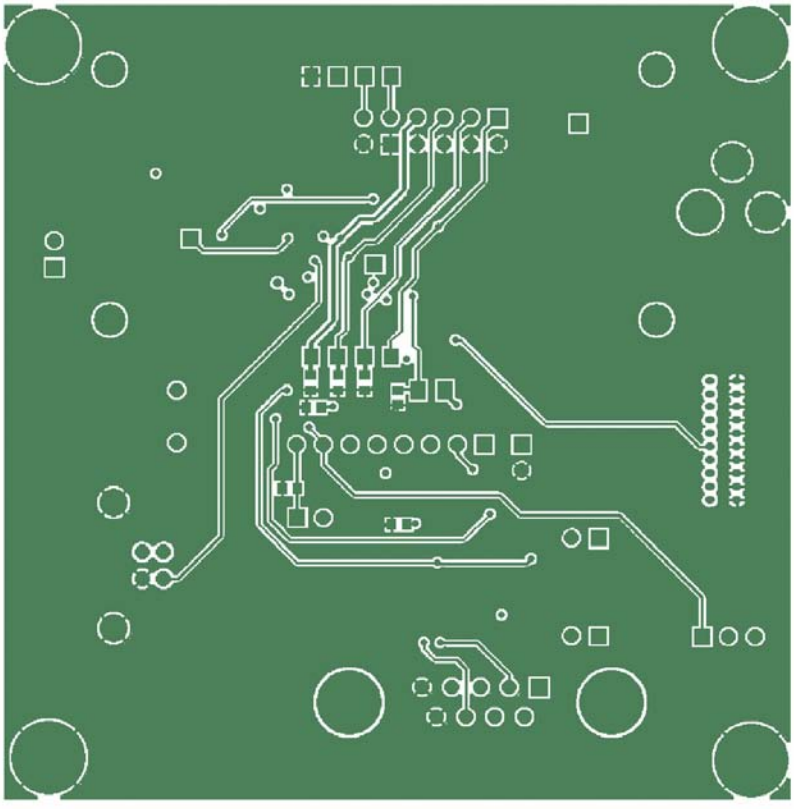


Figure 12: 73S1217F Evaluation Board Lite Bottom Signal Layer

4.4 Bill of Materials

Table 3 provides the bill of materials for the 73S1217F Evaluation Board Lite schematic provided in Figure 10.

Table 3: 73S1217F Evaluation Board Lite Bill of Materials

Item	Qty.	Reference	Part	PCB Footprint	Digi-key Part Number	Part Number	Manufacturer
1	3	C5,C6,C12,C16	27 pF	603	PCC270ACVCT-ND	ECJ-1VC1H270J	Panasonic
2	1	C7	0.47 µF	603	PCC2275CT-ND	ECJ-1VB1A474K	Panasonic
3	1	C9	4.7 µF	603	PCC2396CT-ND	ECJ-1VB0J475K	Panasonic
4	7	C10,C11,C24,C25,C26, C27,C28	22 pF	603	PCC220ACVCT-ND	ECJ-1VC1H220J	Panasonic
5	1	C13	10 µF	3528-21 (EIA)	478-1672-1-ND	TAJB106K010R	AVX Corporation
6	10	C14,C19,C20,C21,C22, C23,C29,C30,C31,C32	0.1 µF	603	445-1314-1-ND	C1608X7R1H104K	TDK Corporation
7	1	C17	1000 pF	603	PCC2151CT-ND	ECJ-1VC1H102J	Panasonic
8	1	C33	10 µF	805	PCC2225CT-ND	ECJ-2FB0J106M	Panasonic
9	4	D1,D4,D5,D6	LED	0805_DIODE	160-1414-1-ND	LTST-C170FKT	LITE-ON INC
10	4	G1,G2,G3,G4	MTHOLE	MTHOLE			
11	5	JP1,TP4,JP4,TP5,TP6	HEADER	5 X 1 PIN	S1011E-36-ND	PBC36SAAN	Sullins
12	1	JP2	HEADER	5 X 2 PIN	S2011E-36-ND	PBC36DAAN	Sullins
13	1	J1	Smart Card Connector	ITT/CCM02-2504	401-1715-ND	CCM02-2504LFT	ITT Industries
14	1	J2	Emulator IF	RIBBON6513	A3210-ND	104068-1	AMP/Tyco Electronics
15	1	J3	USB_CONN_4	USB	ED90064-ND	897-43-004-90-000000	Mill-Max
16	1	L1	10 µH	1210	490-4059-2-ND	LQH32CN100K53L	Murata Electronics
17	1	PJ1	+5VDC		SC237-ND	RAPC712X	Switchcraft
18	1	P1	DB9_RS232		A32075-ND	5745781-4	AMP/Tyco Electronics
19	5	R1,R6,R8,R11,R12	0	603	P0.0GCT-ND	ERJ-3GEY0R00V	Panasonic
20	1	R2	1 MΩ	603	P1.0MGCT-ND	ERJ-3GEYJ106V	Panasonic

Item	Qty.	Reference	Part	PCB Footprint	Digi-key Part Number	Part Number	Manufacturer
21	2	R3,R22	100 kΩ	603	P100KGCT-ND	ERJ-3GEYJ104V	Panasonic
22	1	R4	10 Ω	603	P10GCT-ND	ERJ-3GEYJ100V	Panasonic
23	1	R5	10 kΩ	603	P10KGCT-ND	ERJ-3GEYJ103V	Panasonic
24	8	R7,R9,R10,R13,R14, R15,R16,R17	62 Ω	603	P62GCT-ND	ERJ-3GEYJ620V	Panasonic
25	3	R18,R19,R24	680 Ω	603	P680GCT-ND	ERJ-3GEYJ681V	Panasonic
26	1	R20,R21	24 Ω	603	P24GCT-ND	ERJ-3GEYJ240V	Panasonic
27	2	R23,R25	200 kΩ	603	P200KGCT-ND		Panasonic
28	2	S1,S2	SW	PB	P8051SCT	EVQ-PJX05M	Panasonic
29	3	TP1,TP7,TP8	HEADER 2 x 4		S1011E-36-ND	PBC36SAAN	Sullins
30	1	TP2	HEADER 2 x 4		S2011E-36-ND	PBC36DAAN	Sullins
31	1	TP3	HEADER 8		S1011E-36-ND	PBC36SAAN	Sullins
32	1	U3	MAX3237CAI	SOG.65M/28	MAX3237CAI+-ND	MAX3237CAI+	Maxim
33	1	U4	73S1217F	68 QFN		73S1217F	Teridian
34	1	Y1	32.768 kHz	XTAL-CM200S 6513	XC1195CT-ND	ECS-.327-12.5-17X-TR	ECS
35	1	Y2	12.000 MHz	XTAL/HC49US/.140H	X1116-ND	ECS-120-20-4XDN	ECS

4.5 Schematic Information

This section provides recommendations on proper schematic design that will help in designing circuits that are functional and compatible with the software library APIs.

4.5.1 Reset Circuit

The 73S1217F Evaluation Board Lite provides a reset pushbutton that can be used when prototyping and debugging software. The RESET pin should be supported by the external components shown in Figure 5. R8 should be around 10 Ω. The capacitor C27 should be 10 µF. R8 and C27 should be mounted as close as possible to the IC.

C43 (1000 pF) is shown for EFT protection and is optional.

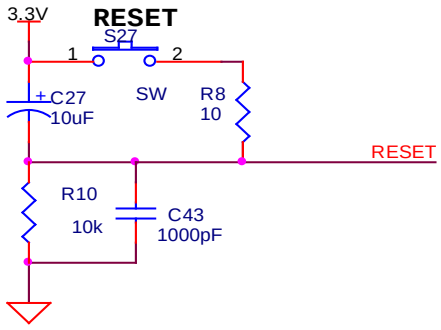


Figure 13: External Components for RESET

4.5.2 Oscillators

The 73S1217F has two oscillators (see Figure 6); one for the primary system clock and the other for an RTC (32 kHz). The system clock should use a 12 MHz crystal to provide the proper system clock rates for the USB, serial and smart card interfaces. The system oscillator requires a 1 MΩ parallel resistor to insure proper oscillator startup.

The RTC oscillator drives a standard 32.768 kHz watch crystal. Crystals of this type are accurate and do not require a high current oscillator circuit. The oscillator in the 73S1217F has been designed specifically to handle watch crystals and is compatible with their high impedance and limited power handling capability.

The 32 kHz oscillator does not require a parallel startup resistor.

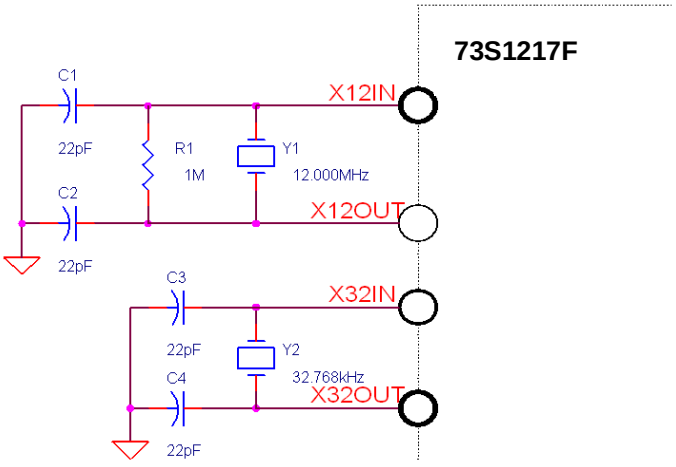


Figure 14: Oscillator Circuit

4.5.3 USB Interface

The USB interface on the 73S1217F requires few external components for proper operation. Two serial resistors of 24 Ω ± 1% are needed to provide proper impedance matching for the USB data signals D+ and D-. These resistors must be 24 Ω ± 1%.

For self-powered USB applications, a connection must be made between the VBUS power input and USR7 for proper operation with the provided API libraries. A direct connection cannot be made as the VBUS voltage exceeds the digital power supply running at 3.3 V. As a result, a resistor divider is required to scale the VBUS voltage down to 3.3 V. Figure 7 shows the basic USB connections.

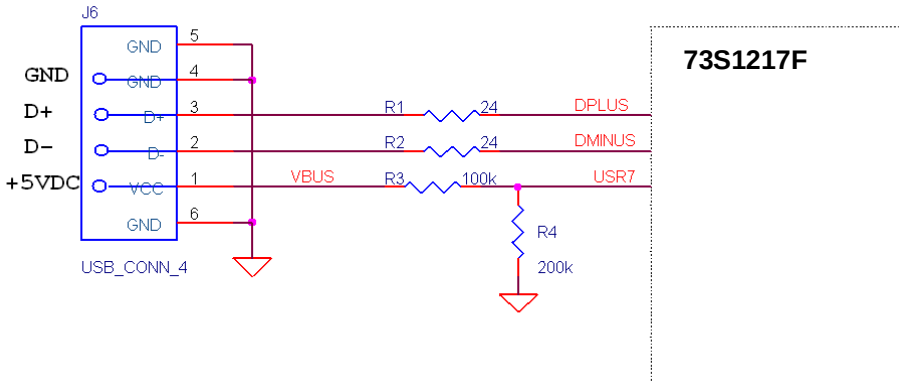


Figure 15: USB Connections

4.5.4 Smart Card Interface

The smart card interface on the 73S1217F requires few external components for proper operation. Figure 8 shows the recommended smart card interface connections:

- The RST and CLK signals should have 27 pF capacitors at the smart card connector.
- It is recommended that a 0 Ω resistor be added in series with the CLK signal. If necessary, in noisy environments, this resistor can be replaced with a small resistor to create a RC filter on the CLK signal to reduce CLK noise. This filter is used to soften the clock edges and provide a cleaner clock for those environments where this could be problematic.
- The VCC output must have a 1.0 µF capacitor at the smart card connector for proper operation.
- The VPC input is the power supply input for the smart card power. It is recommended that both a 10 µF and a 0.1 µF capacitor are connected to provide proper decoupling for this input.
- The PRES input on the 73S1217F contains a very weak pull down resistor. As a result, an additional external pull down resistor is recommended to prevent any system noise from triggering a false card event. The same holds true for the $\overline{\text{PRES}}$ input, except a pull up resistor is utilized as the logic is inverted from the PRES input.

The smart card interface layout is important. The following guidelines should be followed to provide the optimum smart card interface operation:

- Route auxiliary signals away from card interface signals.
- Keep CLK signal as short as possible and with few bends in the trace. Keep route of the CLK trace to one layer (avoid vias to other plane). Keep CLK trace away from other traces especially RST and VCC. Filtering of the CLK trace is allowed for noise purpose. Up to 30 pF to ground is allowed at the CLK pin of the smart card connector. Also, the zero ohm series resistor, R7, can be replaced for additional filtering (no more than 100 Ω).
- Keep VCC trace as short as possible. Make trace a minimum of 0.5 mm thick. Also, keep VCC away from other traces especially RST and CLK.

- Keep CLK trace away from VCC and RST traces. Up to 30 pF to ground is allowed for filtering.
- Keep 0.1 μF close to VDD pin of the device and directly take other end to ground.
- Keep 10 μF and 0.1 μF capacitors close to VPC pin of the device and directly take other end to ground.
- Keep 1.0 μF close to VCC pin of the smart card connector and directly take other end to ground.

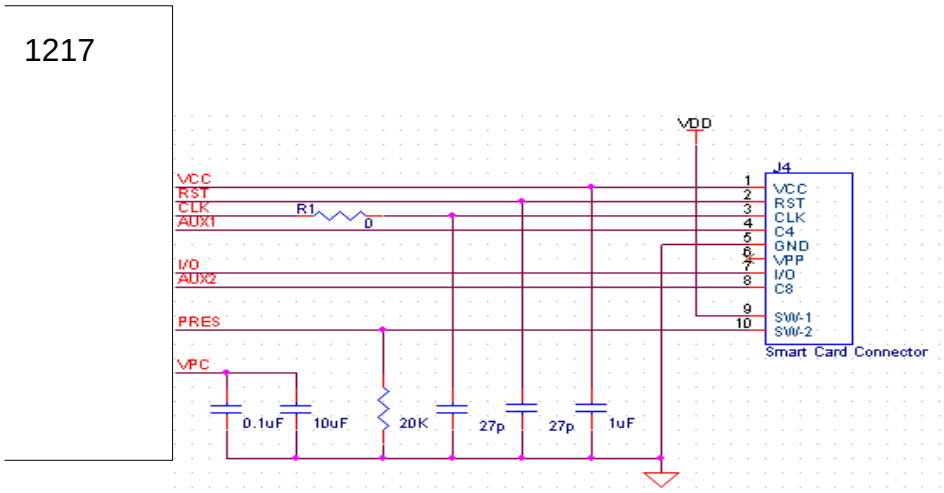


Figure 16: Smart Card Connections

5 Ordering Information

Part Description	Order Number
73S1217F 68-Pin QFN Evaluation Board Lite	73S1217F-EB-Lite

6 Related Documentation

The following 73S1217F documents are available from Teridian Semiconductor Corporation:

73S1217F Data Sheet
73S1217F Evaluation Board Lite Quick Start Guide
TSC Flash Programmer Model TFP2 User's Manual

7 Contact Information

For more information about Teridian Semiconductor products or to check the availability of the 73S1217F contact us at:

6440 Oak Canyon Road
Suite 100
Irvine, CA 92618-5201

Telephone: (714) 508-8800
FAX: (714) 508-8878
Email: scr.support@teridian.com

For a complete list of worldwide sales offices, go to http://www.teridian.com.

Revision History

Revision	Date	Description
1.0	February 6, 2008	First publication.
1.1	April 6, 2009	Minor format changes and corrections
1.2	August 17, 2009	Miscellaneous editorial modifications. Added information from the Quick Start Guide.